

U.S. EPA Meeting with the Synthetic Turf Council, Recycled Rubber Council, and Safe Fields Alliance

March 22, 2016; 2:30-4:00 PM

One Potomac Yard

2777 S. Crystal Drive / Arlington, VA 22202

Room S-5100

Purpose: The purpose of this meeting is for EPA to share information relevant to the *Federal Research Action Plan on the Use of Recycled Tire Crumb on Playing Fields and Playgrounds* and hear information from the synthetic turf industry related to crumb rubber manufacturing, use, and installation in synthetic turf fields. For more information on the *Action Plan*, see:

www.epa.gov/tirecrumb

Attendees: Elliot Belilos, *OFW Law*; Steve Bigelow, *Liberty Tire and Recycled Rubber Council*; Amy Brackin, *Synthetic Turf Council*; Brandon. Bray, *EPA*; Chris Carusiello, *EPA*; Mike Cobb, *Innovanet (consultant to the Synthetic Turf Council)*; Ksenija Janjic, *EPA*; Billy Johnson, *ISRI*; Gabrielle Joseph, *EPA*; Jacqueline McQueen, *EPA*; Charlotte Mooney, *EPA*; Nancy Nord, *OFW Law*; Mike Peterson, *Gradient Corp.*; Rom Reddy, *Sprinturf and Safe Fields Alliance*; Nicole Villamizar, *EPA*

I. Welcome/Introduction (2:30 PM)

Mooney: Thank you for coming in to speak with us. We are in the process of kicking off this study. Jackie McQueen is here from ORD, the study lead. ORCR is gathering information about the industry for ORD to assist in designing and carrying out the study. We will be talking to numerous stakeholders across the spectrum moving forward.

Introductions of all around the table.

II. Overview of EPA's role in implementing the *Federal Research Action Plan*

Mooney: This group doesn't seem to need an introduction of the proposed study, since most everything currently available is on the web already and the group is familiar with it.

Nord: Why don't we move straight into the organizations each giving an overview of what they do and their messages?

McQueen: Can we interject with questions throughout?

Nord: Absolutely, it's your meeting. Brackin will begin.

III. Industry presentation and discussion on various topics

Amy Brackin, Synthetic Turf Council

Brackin: The Synthetic Turf Council [hereafter STC] has 210 member companies ranging from independent professionals (e.g., architects, engineers) to large corporations. We are determined to increase quality standards among our members' products.

The Houston Astrodome put in the first synthetic field in 1966. In 1977, the first fields with synthetic dirt infill were installed. Recycled rubber was and continues to be the infill of choice. There are many alternatives, but it is estimated that 90+% use rubber. Four hundred fifty millions of tons of rubber are used in this way annually. Demand is on the rise. These are durable systems that last 8+ years, and the components can be recycled. There is no need for water, fertilizer, pesticides, etc.

Media reports have theorized that synthetic turf with recycled rubber infill is the common factor in stories of sickness. Since the first reports, we have identified 95 studies dating back to the 1990s on the human health aspects of recycled rubber. According to these studies, there are no risks to human health.

The manufacturers came together to address these questions, forming Safe Fields Alliance [hereafter SFA] and the Recycled Rubber Council [hereafter RRC]. STC sought out an existing, high standard to measure against. Currently no standard exists, so EN 71-3 (the European toy safety standard) is being used. It is now used for all products being used in synthetic turf systems. WK47821 is based on three ASTM test methods (F963, F2075, and F3012) that currently exist. Field installers are testing field installations; testing is now required by many architects and engineers in the bidding process.

In the 18 months since these alarms were first sounded, every manufacturer, processor, and field owner that has tested fields has received positive results and chosen to continue use of their recycled rubber infill synthetic fields. The Cal Ripken Foundation found that none of its 41 fields pose any risk to human health. We believe that if the federal government thoroughly examines this product it will find the same results. We support any studies of this nature that will reinforce our findings. The industry offers its assistance. We hope that this study will answer three questions:

- (1) Are there any chemicals of concern in any amounts in crumb rubber?
- (2) If so, are they bioavailable?
- (3) Do CPSC, CDC, EPA, or another federal agency have access to any medical research providing a linkage between lymphoma and any chemicals whatsoever? Is the rubber itself problematic, or is it chemicals on the surface of the field/the rubber infill?

We ask that agencies consider both recycled rubber and ambient conditions, and compare and delineate effects.

We are absolutely eager to participate in any way we can. We will offer a scientific panel at any time that it is requested.

McQueen: How are the standards used? Where in the process are these standards being applied?

Brackin: There are two sets of guidelines, both dealing with infill. One is very specific to the quality, lifespan, age, etc. of what can be used for infill. The second is newer and is employed to address the need for some kind of testing, since it was recognized that there wasn't one. Both standards are voluntary. The first has been used at reprocessing facilities since 2011, the second since 2015. Both standards test the same product. They are not required at any level, but are being adopted voluntarily at all levels.

Nord: In 2015, we picked the most stringent standard we could be reviewed against. This is the European toy safety standard, EN 71-3, and everything tested has passed so far.

Bigelow: It's easy to control the sourcing of material since industry is overall very small. Of the nine companies manufacturing infill, the seven biggest are involved in STC.

Villamizar: Is crumb from multiple facilities combined and sold as a single unit?

Bigelow: There are eight tire manufacturers in the U.S., and those tires end up homogenized at facilities. Material ends up being very uniform because no facility is sourcing from just a subset of tire manufacturers. Very little fluctuation in test results 2011 to today.

Mooney: I assumed that there would be regional catchment areas in play here, for tire sourcing and delivery of the crumb.

Bigelow: The tire collection process is very geographical in nature, but there is not a concentration of a specific tire brand in a specific geography that would skew the test.

Villamizar: What about imported tires? Are there other chemicals or manufacturing regulations in play?

Bigelow: We do not see a lot of variability. International tire manufacturers have to adhere to the same standards as U.S. manufacturers in order to export their products to the U.S. The end result is very similarly constructed, and when crumbed there is little fluctuation in composition.

McQueen: Some processors try to restrict the use of foreign tires based on the tires' age. Is this universal?

Bigelow: It's difficult to do. If we have a customer that wants specific tires, we try to adhere to that request, and are probably ~90% accurate. An occasional tire slipping through would not shift the test results.

Brackin: As an industry we do not see crumb being imported. There is no product being ground internationally and then imported.

McQueen: But, for example, if Chinese tires are being imported, those would be ground more domestically.

Brackin: We've performed literally hundreds of tests and have not been failing them. If imported tires are getting into the stream, it's not affecting the test results.

Carusiello: Why do some companies want specific tires to be used in their crumb?

Bigelow: Truck tires, for example, do not have any wire or fiber and are therefore a little more usable for some applications because those contaminants don't have to be removed, so it speeds up material processing.

Reddy: There are some types of tires that we just don't use at all for recycled rubber infill. Truck tires and off-roading tires do not go into SFA fields. Only passenger vehicle tires are used for our members' playing fields. A shredder used for car tires cannot be used for truck tires, and vice versa.

Bigelow: Truck tires may be used in mats, or other instances where a uniform color is desired.

Steve Bigelow, Liberty Tire / Recycled Rubber Council

Bigelow: I will provide a broader overview and some insight into the scope of the rubber industry. RRC was brought together in 2015 in response to media reports. It's a consortium of rubber processors looking to communicate and educate about the many beneficial uses of recycled rubber. There are ~350 million passenger tire equivalents [hereafter PTE] produced annually. This includes passenger/light duty tires and commercial truck/bus tires. We assume that one PTE is 22 lb., so a single truck/bus tire would be ~5 PTE.

Scrap tire stockpiles were significant in the 90s, but have been reduced to fewer than 75 million tires through beneficial use. Recycled rubber goes into a multitude of recreational and other uses, totaling about 3.8 million tons of tire being recycled annually, totaling about 7.7 billion pounds of scrap rubber. Whole pieces being processed into new products make up ~90% of the market; the remaining 10% is used for tire products. The 90% breaks down into tire derived fuel and crumb rubber. About 750,000 tons of material becomes crumb rubber annually.

The four main categories of crumb rubber use are industrial products, playground/landscape mulch, field infill/tracks, and asphalt. Rubber goes through ambient or cryogenic processing. Ambient processing is iterative, with mechanical grinding and cutting. Cryogenic processing involves freezing the rubber with liquid nitrogen and then pulverizing it. Nothing is added to or taken away from the original rubber composition. It is just processed into smaller, reusable pieces.

McQueen: What is the "wet method"?

Bigelow: This is ambient processing.

Janjic: Is it all used tires, or is some of the feedstock rejected or unused product?

Bigelow: Recalled tires are generally recalled not for chemical composition problems, but for mechanical issues. Recalled tires will be drilled so that they cannot be resold or reused as tires. Some manufacturers want their recalled tires shredded and then landfilled, but when that requirement [drill hole] isn't present, they can become crumb.

McQueen: Do facilities only use one processing method, or do facilities commonly use both?

Bigelow: Generally, facilities do one or the other. Some facilities do both, but they would need two full setups to accomplish this. Liberty Tire only uses the ambient process.

Janjic: Is one process preferred overall?

Bigelow: It's specific to the end user.

Reddy: Ambient processing has by far the biggest market share. It is a mechanical milling process, the tire material is granulated.

Brackin: Cryogenic processing is generally more expensive. It uses liquid nitrogen, pulverizes the tire material into smaller pieces.

Cobb: The two types of processing also yield product with different surfaces. Cryogenic processing yields flatter, sharper edges, since the rubber has been shattered. The sharper edges are not good for fields.

Brackin: Probably only ~50-60 million pounds annually are processed cryogenically.

Villamizar: Has the composition of new tires changed significantly in recent years, say the last decade?

Bigelow: Over the lifespan of Liberty Tire, our test results have not changed significantly.

Villamizar: Does the ASTM standard focus only on lead?

Brackin: The proposed ASTM standard will take the European toy safety standard that looks only at heavy metals and expand it to include two other methods already in use in playground standards to account for all extractable metals and to cover all infill types, not just recycled rubber.

McQueen: Does recycled rubber infill use anything other than tires?

Bigelow: No.

Brackin: Nothing other than passenger vehicle tires is accepted to be used as infill. The industry follows it very specifically. (Check Section F in the binder for more detail)

Mooney: Is there a reference for what types of products are being made with crumb rubber?

Bigelow: If it has rubber in it, it probably has recycled rubber in it to some degree. Some products use only virgin rubber, but very few. Roof shingles, paths, equestrian mats, floor mats, etc. [The guards in EPA's building stand on mats that use recycled rubber.] I can try to pull together an actual more comprehensive list.

Mooney: How are testing results being made available?

Brackin: The standard is voluntary. We are open to any of our information being made available to include in EPA's work. Testing is being done on a regular basis outside of the existing body of peer-reviewed studies, and these data can be made available to EPA. We don't solicit data from our members on a regular basis, so copies of everything being done are not necessarily on hand. We tell end users and installers, "Here are the guidelines, if you want to take these and test your product, do." We can offer testing data from our member companies, but we can't necessarily provide an inclusive list of everyone who's done testing historically.

McQueen: Does any treatment happen in facilities before, during, and after processing? We have heard of some that use talc, that some may apply an antimicrobial product, that water is used, etc.

Bigelow: In processing, nothing is added to the tires, specifically when recycled rubber infill is being produced. Some end users do want talc in the final product as a flow agent, but not in infill. Landscape tile, for example, may use talc, but it's always specific to customer requests. That's only 2-3% of requests. We don't add anything to our end products voluntarily.

Some water may be used during ambient processing, but this is only for cooling as ambient process generates heat.

Janjic: Do you only process as you receive orders? Or is it continuous?

Bigelow: About 15,000-20,000 tires are processed per facility per day. The material needs to go

somewhere. There is no room to store or hold materials. So yes, it is constantly being processed. Material is not being stored. Infill is shipped directly to the field, it is not stored at our facility.

McQueen: Material can be provided to any of the major installers?

Reddy: Yes. 80-85% of all infill is provided from probably the five biggest suppliers to SFA members.

Villamizar: We're interested in hearing about any processing differences for indoor and outdoor fields and fields in different geographic locations.

Rom Reddy, Sprinturf / Safe Fields Alliance

Reddy: SFA represents about two thirds of the synthetic turf fields in the U.S. We do not make the infill. We are all about player safety. We advise our customers on how infill can help to keep players safe. Infill is less than 5% of the cost of the field. It is not a money maker for the industry, but it prevents injury.

Prior to the NBC report, this focus on cancer was not present. We've adopted the exposure limits in EN 71-3. An independent study was done on crumb rubber samples from the Montreal school district. There was a huge gap between the results of this study and the actual EN 71-3 limits. Right now we're trying to help parents, schools, etc. focus on the science because huge business impacts are being felt in the face of overwhelming science. For the last three fields we installed in Connecticut, the cities were given data – one even did its own testing – and they all decided to stick with crumb for the field infill. The media is creating a battle that the science doesn't support. There are time limits to this – we need a timely response to prevent our industry from slowly being destroyed unnecessarily. We use EN 71-3 as well as the California Human Health Screening Level Guideline, the EPA heavy metals standard, the Prop. 65 standard, and volatiles and semi-volatiles analysis. We test every tenth field that we install. It statistically makes no sense to do these tests because our testing results are nowhere near the EN 71-3 limits. Statistically, we should be moving towards testing 1 in 50 fields, but the publicity keeps us from doing this.

Anecdotally, people find the science convincing, but I wonder if the negative can be proven – that crumb rubber cannot cause cancer? After the NBC interview I did, Brown University said that they might have an answer. They proposed a two-phase study. In phase one, they would expose human lung and stomach cells to crumb rubber and look for any transformation that occurs. In phase two, they would do the same study with live mice. We would like sponsorship from NIH or some other independent body for this. We don't want it to be seen as the industry influencing the outcome.

There are over 10,000 synthetic turf fields in the U.S. Research has shown that having a synthetic turf field increases "play time" five-fold. Users need turf because it can be used right after the rain, avoid pesticide use, and helps to avoid over-used grass fields. Typically, turf is made of polyethylene fibers that are 2-2.5 inches in height, with polypropylene backing and urethane on the back to lock in the stitches. The turf is then infilled with crumb rubber to ~75% of the height of the fiber. It's all laid on a base prepared with 5-6 inches of stone over a panel of drains to allow water to filter out. They meet very stringent performance standards that have been set by the NFL and FIFA for absorption, energy restitution, etc. They have high durability.

Sprinturf just replaced a field at St. John's in Georgia that was 11 years old. Two thirds of the infill was reusable, almost like-new. Reusing infill is possible but not all customers want that. Customers may specifically ask for all new infill. We save ~100,000 gallons of water per field, and no fertilizer, insecticide, etc. needs to be used. A single field recycles 20,000-25,000 tires. The only maintenance is brushing, raking, and sweeping. 5-10% of fields have colored lines. For most fields, any colored lines are tufted in, not painted on. We do not recommend any chemicals for cleaning.

There's no difference in the crumb used or the installation process between indoor or outdoor fields. Sometimes indoor fields get more use, so they may need a more robust fiber for the turf. Geographically, some newer technologies make fibers heat reflective ("Cool Fiber"); "Cool Fill" is crumb rubber that gets a green latex paint coating, but is <5% of the market.

Bigelow: The number of companies using colored crumb is in the low single digits; of those, probably 99% use green crumb. The paint is added at the manufacturing facility.

Reddy: We crumb tires mechanically. No chemicals are added during the process. This is the safest, most durable infill system. Alternatives include organics, coconut, coconut husk, EPDM (rubber polymer), TPE (thermoplastic elastomer) fields. Other infill systems, like organic infill, mean importing untested products that end up in our landfills, rather than reducing waste in the U.S. Organics dehydrate. They need to be checked for moisture levels twice weekly, and have sprinkler systems installed to keep them moist. If not, they will harden and hurt kids without the proper hydration. A crumb rubber field can be left largely to its own devices for ten years and we will know that the kids using it are safe. The infill layer is only present for safety, and other infills are not nearly as safe as crumb rubber. Zeolite, Nike Grind – rubber from Vietnam, mainly plant waste from 3rd party contractors - and TPE (thermoplastic elastomer) from Germany are other infill options with very little history and very little testing. The City of Los Angeles recently had to pull up two fields where the TPE had melted. They are running away from one of the most intensely tested products that exists.

Mike Cobb, Safe Fields Alliance (Consultant)

Cobb: I am an independent consultant for SFA. I do not work anywhere in the recycled rubber value chain except for where scientific guidance is needed. I'm here to help us understand the existing body of scientific knowledge, especially of published knowledge. I have looked specifically at a significant body of published knowledge going back to 1990. This includes studies and studies of studies from 1990-2015. We've identified 96 studies, and have put together a compendium with data from 95 of them. This database is on the STC website. 26 of these studies were done by universities and research institutes; 44 were done by city, state, and federal governments; and 22 are consolidated reports of prior studies. They look at all potential bioavailability pathways, including 34 studies on inhalation, 45 on ingestion – some using synthetic biofluids – 27 on dermal contact, and 11 looking specifically at cancer, mostly since 2010. We did not purposely leave anything out. This is every study we're aware of. No study has shown any link between recycled rubber infill and cancer or any other human health risk. Studies have concluded that recycled rubber infill does not pose a human health risk, and have looked at athletes, children, adolescents, and adults. Every age was looked at. One study that is quite frequently cited does not have any merit. There is a very recent study that falls into the same category because it is not good science.

These studies have looked at metals, VOCs, PCBs, PCV, PCT, PAHs, bacteria, PBDE, [and others]. They cover over 115 fields. Are there gaps in what's been looked at? There is always the opportunity for more work and more studies. What will be most beneficial is making sure to look at baselines – establish a background to make sure the crumb rubber is all that's being analyzed. If you map out the compounds being looked at, the conditions under which the compounds were tested, etc., there are not a lot of data gaps. Please feel free to reach out to me as a resource. I am passionate about the science and know that the science will prevail.

Does recycled rubber infill break down over time? What compounds are in recycled rubber infill? What “bad actor” compounds are in the infill in the first place? Anything that is present is present at or below acceptable standards. Recycled rubber infill is a vulcanized, heavily cross-linked material. It is very, very difficult to break down vulcanized rubber. Anything that's in there not only is at low levels to begin with, but is trapped in there.

Mike Peterson, Gradient Corp.

Peterson: I am currently working with the RRC as a scientific advisor. Around one year ago I was contacted by a health district in Washington regarding funding a grant for crumb rubber fields. I was asked to do a screening-level review of the existing literature. I took most of the already mentioned studies, including air sampling, and found that more than 95% of the chemicals screen out before even accounting for bioavailability. Metals and PAHs are found at levels similar to natural soil. Crumb rubber is often discussed in a vacuum, as if the chemicals must come from rubber or from nowhere, but they are actually present in the background as well.

We are moving on now to a full risk assessment using all of this data, and are hoping to publish this summer. Dr. Chatterjee at Brown University is doing an in vitro genotoxicity study to look at the carcinogenic potential of the product itself, not just the individual chemicals. Phase 1 will be done in vitro; Phase 2 will be a long-term carcinogenesis study in live animals. The main considerations include only using validated methods – the OECD-validated micronucleus assay and the HPRT Assay – looking at types of mutations, including chromosomal aberrations as well as a broader range of DNA impacts from HPRT that could lead to carcinogenic events. Different cell lines are being used for assay variation, including hamster lung cells and lymphoblasts, the precursors to lymphocytes, which are involved in lymphoma. We will account for bioaccessibility by using three simulated biofluids: sweat, digestive fluid, and lung fluid. We are also talking with Cal EPA (working with Paty Wong at OEHHA) about the modification of these synthetic fluids. We want this study to be as identical as possible to their study. We are offering the same to EPA.

McQueen: Where is this process right now?

Peterson: The sooner you can ask us for input, the better. Cal EPA got public input on the study proposal as well, and now will be using a lipid sink. The study will account for multiple types – virgin recycled rubber, aged recycled rubber, and natural soil samples, which will be added to the Cal EPA, too. There are positive and negative controls. We are adding an enzyme to provide bioactivators such as pH that are sometimes needed for carcinogenesis. The six field samples will come from Washington, Connecticut, and California; natural soil samples will come from the same sites to provide background. We are developing the field sampling plan right now.

Reddy: SFA has already provided six virgin samples to Brown University for this study. This

will add to the 96 studies that already exist. It still may not convince the people who need to be convinced. At the end of this process, we will have a published, peer-reviewed study. If the results are positive, we can say that statistically, crumb rubber cannot cause cancer. This is the end-game. The conversation has changed to people that may not understand bioaccessibility, etc. We need to be able to outright say, "Crumb rubber cannot transform cells in this way." This is the closest to a certain answer, to closure, that we can get.

Peterson: Samples will be subjected to each of the three biofluids, and go through both of the assays discussed. Benzo(a)pyrene is the positive control, since pH is brought up so often; the biofluids alone will be the negative control. In the end, over 190 samples will be run in triplicate. Phase 1 is underway but has not fully started. Hopefully Phase 1 will be completed within 12 weeks once analysis starts. Phase two schedule is to be determined, and then we will publish as soon as possible.

IV/V. Discussion and Establishment of Follow-up Activities

Brackin: We have tried to do our homework to assess the problem, to look at it from as many angles as we can and to offer assistance.

Villamizar: It's important to EPA to get field experience, to go out to visit processing facilities in different parts of country.

Bigelow: We are open to that. Art Dodge, the President of eCore in York, Pennsylvania and the RRC's VP, has volunteered his facility. I can also offer any Liberty Tire facilities. Any ambient processing facility will be very similar to any other ambient facility. The same is true with cryogenic processing facilities.

Reddy: Sprinturf has 50-60 fields being installed in the northeastern U.S. this year alone. We can show you the installation stage or reinstallation, maintenance, etc. Sprinturf extrudes the fibers, does tufting, etc. on-site and can show you that. We are based in Chatsworth, Georgia.

Brackin: Most synthetic turf manufacturers are located in Georgia.

McQueen: EPA is looking to sample a variety of geographical locations and climates, and both indoor and outdoor fields. We are not looking at virgin material versus aged material.

Reddy: How many fields do you want to look at?

McQueen: Because of time and resource constraints, we can't look at more than 40 fields, which is already a very ambitious number. We want to sample at all sites, do air monitoring, etc. this summer, and have data by November.

Belilos: Are there plans to sample grass fields nearby?

McQueen: Not currently. We take the point seriously and have pushed hard for grass samples.

Brackin: Take for example the Cal Ripken Foundation. They have 41 fields nationwide (and 10 under construction), and these fields are in use by all age groups. They could give you a geographic spread, samples from different manufacturers, etc. If they'll agree, they can give EPA what it needs in one fell swoop.

McQueen: EPA is feeding info to CDC. CDC is actively doing the outreach to gain access to

fields.

Reddy: Air measurements need to be taken directly above fields and also away from the field. We have found differences between urban and rural areas because urban areas have different background. A baseline is necessary.

Peterson: We have not figured out a way to determine what has been deposited on the field after installation versus what is genuinely from crumb rubber.

McQueen: Some people choose not to reuse rubber, what happens to old infill?

Reddy: It's typically not reused because sand has gotten mixed in and is hard to separate back out. The used rubber ends up in a landfill in this case. People are getting more and more okay with reusing rubber, but only about two thirds is able to be extracted for reuse.

4:05 PM – Adjournment

Potential follow-up items:

- Compiling a comprehensive list of recycled rubber products (as offered by Steve Bigelow)
- Making the testing data from manufacturers, processors, and field owners available (as offered by Amy Brackin)
- Visiting processing facilities in different parts of country (as offered by Steve Bigelow).
- Experiencing the installation, reinstallation and/or maintenance of synthetic turf fields (as offered by Rom Reddy)
- Potentially collecting samples from Cal Ripkin Foundation (as offered by Amy Brackin, ORD to follow-up)
- Sharing the presentation from ToxExpo meeting (as offered by Michael Peterson)